structure of this model. In particular, give a physical explanation for the phase shift.
6. Predict what the output would be if the model had no phase shift. Would days be hotter? If so, by how much?

Problem 4.6: Fourier Transform Pairs

Find the Fourier or inverse Fourier transform of the following.

1. $x(t) = e^{-(a|t|)}$
2. $x(t) = te^{-(at)}u(t)$
3. $X(t) = \begin{cases} 1 \; if \; |f| < W \\ 0 \; if \; |f| > W \end{cases}$
4. $x(t) = e^{-(at)}cos(2\pi f_0 t)\, u(t)$

Problem 4.7: Duality in Fourier Transforms

"Duality" means that the Fourier transform and the inverse Fourier transform are very similar. Consequently, the waveform *s (t)* in the time domain and the spectrum *s (f)* have a Fourier transform and an inverse Fourier transform, respectively, that are very similar.

1. Calculate the Fourier transform of the signal shown below (Figure 4.23(a)).
2. Calculate the inverse Fourier transform of the spectrum shown below (Figure 4.23(b)).
3. How are these answers related? What is the general relationship between the Fourier transform of s (t) and the inverse transform of *s (f)*?

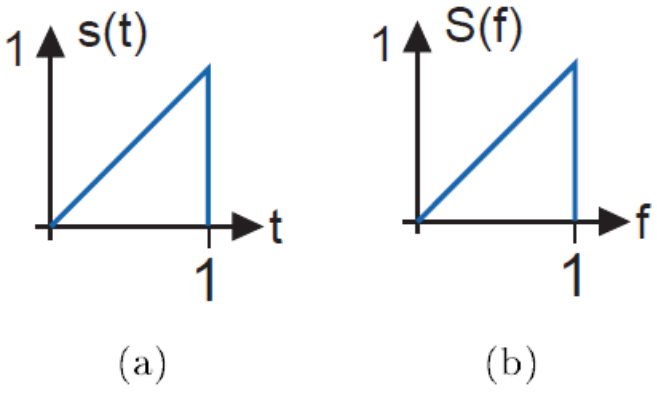

Figure 4.23 Duality in Fourier Transforms